Game Modification Exercise
on The Number Guessing Game

GAME 601

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Date: 2021.09.04

Abstract – There are many simple games that exist and are applicable for people to learn and play easily. The Number Guessing Game is one of them, whose rule is to let one player choose a random number from a limited range and decide winning or losing according to whether other players guess the correct number. However, this rule contains some defects and makes this game "broken". In this article, I will analyze these defects based on my opinion and a modified set of rules is introduced.

1. The Original rules

Just like what is mentioned in the abstract, the original rules for Number Guessing Game are simple. Below are the rules and steps of it.

a. Normally two players will attend. One of them is chosen to select the correct answer and the other one needs to guess.
b. The range of answers needs to be decided and both players should agree with it. In most situations this range will be 1 to 100, but other upper and lower limits are also possible to be chosen.
c. The first player decides the answer, and keeps it as a secret in mind.
d. The second player guesses the number. The first player will tell him/her this number is correct or wrong.
e. The condition for winning or losing depends on the players. In some cases, if the second player guesses the number successfully then he/she is the winner; otherwise, the first player wins.
f. The second player may have only one chance, or multiple chances can be given. In this case, he/she only needs to give the correct answer in limited chances to become the winner.
g. More than two players attending this game is also possible, and every player except who decides the answer can try to guess the number. Winner will be the player who gives the correct number in given chances; otherwise, the player who decides the answer can be the winner.

The rules are a little long, but they are easy to remember. Simply speaking, players decide the range of answers and the number of chances which will be given to guess the answer at first. Then one of the players chooses the answer and others guess. If anyone among the latter can give the correct answer in given chances then he/she wins, otherwise the former wins. Perhaps some detailed rules may change according to the players, but the overall process should be similar.

2. Analysis and Design Process

Games always require players to make choices for their goals. In the Number Guess Game, it is obvious that the choice needed to be made is "which number to choose as the answer". For the player who decides the correct answer at first, I think these rules are fine; but for the player(s) who need to guess the answer, I think there are three points which may make them think "it's not interesting". Or to say, make this game "broken".

Firstly, the probability for players to guess the correct answer is too small. Although the exact range is decided based on all of the players, the usually lower and upper limit is 1 to 100. However, there is only 1 correct answer, which means the probability for a player to guess the correct answer in one chance is only 1%. According to the detailed rules between players, perhaps multiple chances can be given to guess the answer. But the probability for players who guess the number to win is still lower than that of players who decide the answer in most cases. On the other hand, if the number of chances reached a higher level, then the probability for players who decide the number to win will become lower

respectively. This situation will also be discussed in the next paragraph.

Secondly, a method called dichotomy can be used in this game. Simply speaking, dichotomy means to divide something into two parts and no element in the whole can belong to both parts at the same time. In this game, assume players use 1 to 100 as the range and each time, the player who decided the final answer can tell others "The number you guess is less than or larger than the correct answer". Then dichotomy can be used. One player can say 50 in the first chance. If 50 is less than the answer, he/she can speak 75 in the second chance and use the middle number in range 51 to 74 or 76 to 100 in the third chance, etc. This method can only be used when players can know the relation between the number they guess and the correct answer, and they must have several chances or multiple players exist. But if it can be used, then players can detect a relatively accurate and small range in a few chances, which can make it hard for players who decide the correct answer to win. However, if this method cannot be used, the situation in the previous paragraph will happen and players have only a small chance to guess the correct answer.

Lastly but not the least, it is hard to confirm the player who decided the final answer is honest. Of course, the probability for this situation is low, but I think we cannot say that players who guess the number can trust the player who decides the answer completely. Perhaps the player who decide the answer is not willing to lose so he/she doesn't approve someone has touched the correct answer; or players cannot reach the correct answer for too many times (since the probability is really low) so he/she think the player who decided the answer told a lie in the previous rounds. No matter how, the result for each guess only has "correct" and "wrong" answer. And I think most players want to win even in a simple game.

According to these three points, I considered two modifications to the original rules. The game is still simple and I believe my modification can be helpful in giving the players a more interesting gameplay.

The modification towards the third defect is easy – I think players can take some mediums like small pieces of paper. For each answer, players write down the correct answer on one piece and cover it on the table. Each player in one round has only one chance to guess and the one who decides the answer will open the paper to show the correct answer at the end of this round. In this way, everyone can trust that the player who decides the final answer didn't lie or play tricks.

Another modification aims at the low probability of touching the correct answer, but it is really hard to adjust this probability. The range of answers is decided at the start of the game and every player agrees with that – even if they know the probability for guessing one number between 100 numbers is hard. So, I think this game can be modified to use a scoring system. Taking the range of 1 to 100 as an example. One player decides a correct number and each of the other players has one chance to guess in one round. If the difference between the number they guess and the correct answer in the range from 31 to 50 then this player gets 1 point; if the difference in the range from 11 to 30 then gets 2 points; a difference in the range between 1 to 10 worth 3 points and hits the correct answer worth 4 points. If no one hits the correct answer, then the player who decides the answer can also get some points but this amount needs to be decided

based on the number of participants who guess the number and scores for guesses. If the number of guessers is small, this point should also be relatively low. Of course, this player can also choose not to earn the scores and let the winner only be raised from guessers. After several rounds, the player with the highest score becomes the winner. Of course, the points and corresponding difference ranges should also be decided by all the players at the beginning.

In my opinion, these modifications can help reduce the probability or worry of a player who decides the correct answer has played tricks, and modify the chance to win for both sides to a relatively fair level. It is hard to say how a good player or a bad player will act in this game. The original number guess game is a game that depends on fortune only, and the modifications don't change it - these modifications only work to make sure that guessers can earn some points to struggle for becoming the winner even if they failed to hit the correct number.

3. Edited Game Rules

After my modification, the rules for The Number Guessing Game become the following steps:

a. Normally two players will attend. One of them is chosen to select the correct number and the other one needs to guess. More players is also applicable, but there can be only one player to decide the number in each round.

b. The range of answers needs to be decided and all of the players should agree with it. In most situations this range will be 1 to 100, but other upper and lower limits are also possible to be chosen.

c. Players need to decide something else, too. Such as how many rounds will be played, and how many points can be earned according to the range of difference between the correct answer and the number guessed. Still, these should be agreed by all of the players. If more than two players exist, the player who decides the answer can choose whether to attend in a struggle for the winner. If this player attends, the score for him/her if no one hits the answer also needs to be decided here. This score should be adjusted based on the number of other participants. More guessers mean higher probability to hit the answer, and the score can be relatively higher as the reward.

d. The first player decides the answer, write it down on any medium like one page of a notebook or one piece of paper and cover it on the table. Make sure no one else can read the answer.

e. The second player (or other players) guess the number. Only one chance is given to him/her in one round. At the end of this round, the first player will show the correct answer and score for each player in this round is recorded.

f. A new number should be chosen for the next round. The player who decided the number in the previous round can keep choosing numbers, or other players can try this position. No matter how, every player who struggles for the winner can earn a score accordingly.

g. The condition for winning or losing depends on the total score of each player after all the rounds are completed. The player with the highest

score becomes the winner.

Both modifications mentioned in the second part are included in these edited rules, and I think this set of rules can be better.

4. Photo of The Game Being Played